Deposition of Nitroglycerine from the Live Firing of M72 A5 66-mm Rockets

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Introduction
• High levels of propellant residues detected at all anttank ranges sampled across North America
• M72 66-mm shoulder fired anttank rockets frequently fired on Canadian anttank ranges
• DNDC teamed up with the 22nd Regiment live fire training in Lrit Anttank range, Garrison Valcartier
• Ninety eight rounds fired over two days

Objective
Evaluation of the mass of propellant residues ejected in front and behind the firing point (FP) from the live firing of M72 66-mm anttank rockets

Propellant charge
• 66-mm, 122 g of M7 propellant (43.3 g of NG per round)
• NC: 54.6 %
• NO: 35.5 %
• AP: 7.6 %
• EC: 1.2 %
• Carbon black: 0.9 %

Method
• 11.96 kg of propellant used in the firing of 98 rounds = 4.245 kg of NG
• Only 30 m surface was available behind FP and 10 m in front
• Particle traps were used and trap holders were designed and used to collect propellant particles deposited
• Five traps were placed in two rows parallel in the front of the FP at +5 and +10 m and covered a width of 10 m
• Six parallel trap rows were set up at -5, -10, -15, -20, -25, -30 m behind the FP and covered a width of 10 m
• Samples were processed by rinsing the traps with ethanol, ethanol evaporation and dissolution in acetonitrile using wrist action shaking and ultraconcentration
• Extracts were analyzed using EPA 8330b HPLC method

Results
• Trap holders and the template used were successful
• The total amount of NG dispersed for the 98 rounds was 4.1 g
• 0.1 % w/w of NG deposited on the surface soil, or else, 42 mg of NG is deposited per round of M-72 A5, as un-reacted residue
• First day: 92% of the residues projected behind the FP were located in the first 20 m behind the FP
• Second day: 90% of the residues detected behind the FP were located in the first 15 m behind the FP
• Good reproducibility between day one and two.

Conclusions
• Our set-up was large enough
• Relatively large errors associated with small decision units
• 66-mm: Deposition of 0.1 % w/w of NG or 42 mg per round
• A previous trial with 84-mm: Deposition of 14 % w/w of NG or 20 mg per round
• 475 M72 rounds to deposit the same quantity of NG as one 84-mm round
• The presence of AP in the M72 propellant composition might explain the better combustion measured
• 95% or more of NG is deposited behind the FP in the first 20 m
• Deposition studies will allow the calculation of ranges source terms and further modelling of the propellant residues fate and transport

Future Work
• Trials will be reproduced using both snow as the collection media and particle traps to compare methods and confirm results
• Deposition studies will be conducted with other calibers (triple base propellants, 25 mm, 40 mm grenades)

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